and very shortly after the Wealden the vegetation of the world experienced a very remarkable transformation."

WIELAND[24] has investigated the problematical fossil *Cryptozoon*, and the much discussed question of the origin of the oolites. Oolites and *Cryptozoon* are said to be notable features of the Ozarkian. According to WIELAND, *Cryptozoon* is a marine alga "which formed vast reefs in the Ozarkian oceans"; and in connection with a description of a new species of *Cryptozoon* from Pennsylvania, and the general occurrence of similar forms (as *Eozoon*, for example) in the early Paleozoic, he concludes that the hypothetical "age of seaweeds" preceding the coal plants is a reality.

BERRY[25] has contrasted the ancestry of our present walnuts and hickories, so far as they can be recognized as fossils, back to the Middle Cretaceous, and presents evidence that at this remote period their geographical range and their abundance were much greater than now. This evidence also enables him to explain the geographical distribution of the living representatives of the family.—J. M. C.

Slope-direction and forest distribution.—TURESSON[26] points out that *Pseudotsuga taxifolia* (Douglas spruce or red fir) is confined to north-facing slopes in the Spokane region in eastern Washington. He says "the evidences have shown that exposure is the regulating factor in the distribution of the tree in this region, the northern slopes and ridges being the only localities which offer the needed humidity in soil and atmosphere." He adds "not only around Spokane but in all more or less arid regions can this be observed." He cites from his own observations and from literature several instances illustrating the fact that the southern slope tends to be more xerophytic than the northern. After calling attention to the fact that this tree reaches its best development in the Puget Sound region, he cites COWLES[27] to indicate that near its areal limits a species "can grow only in those formations which resemble most closely in an edaphic way the climatic features at the distribution center." Speaking of the distribution of this tree in the San Juan Islands, he calls attention to the similarity in climate between these islands and the Spokane region. He then says "it is not surprising to find *Pseudotsuga taxifolia* confined to the northern slopes of the hills in these islands." Quoting from a paper by the reviewer,[28]

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[24] WIELAND, G. R., Further notes on Ozarkian seaweeds and oolites. Bull. Amer. Mus. Nat. Hist. **33**:237–360. *pls. 14–19.* 1914.

[25] BERRY, EDWARD W., Notes on the geological history of the walnuts and hickories. Smithsonian Report for 1913. pp. 319–331. 1914.

[26] TURESSON, G., Slope exposure as a factor in the distribution of *Pseudotsuga taxifolia* in eastern Washington. Bull. Torr. Bot. Club **41**:337–345. 1914.

[27] COWLES, H. C., The physiographic ecology of Chicago and vicinity. BOT. GAZ. **31**:73–108, 145–182. 1901.

[28] RIGG, G. B., Forest distribution in the San Juan Islands: a preliminary note. Plant World **16**:177–182. 1913.

he says, "RIGG has . . . . pointed out the seemingly peculiar distribution of *Pseudotsuga taxifolia* as limited to the north-facing slopes of the hills." It is perhaps generalizing too much to say that the species under discussion is confined to the north-facing slopes "in *all* more or less arid regions," although the phenomenon is undoubtedly of frequent occurrence. If the reviewer interprets COWLES correctly, the absolutely rigid application of the principle quoted from his paper of 1901 is not in accord with the spirit of his more recent teaching. In regard to the quotation from the reviewer's paper, the facts are that the paper cited pointed out *four cases only* in these islands where the forest is largely limited to the north-facing slopes. It would be generalizing too much to say that this is true in all cases in the islands. The whole subject of forest distribution in the San Juan Islands should be made the subject of a careful field investigation. The point of view from which the paper is written is very suggestive and it forms a valuable contribution to the subject of forest distribution in the Northwest.—GEORGE B. RIGG.

Available soil moisture.—ALWAY[29] has grown plants in water tight cylinders until they die from lack of available moisture, and made careful determinations of the moisture conditions of the soils. He concludes that for comparing the available moisture in soils either the wilting coefficient or the hygroscopic coefficient may be used with equal efficiency. The former seems to him preferable in considering conditions of germination and growth of crop plants, and the latter in considering the seed production of such annual plants as field grains and the maintenance of life of perennial plants. Under the conditions of his experiments, most plants seemed capable of producing little or no growth after the soil moisture fell below the wilting coefficient, but whenever there was a well developed root system and no remarkably unfavorable conditions obtained, the plants were able to reduce the moisture content of the soil almost or quite to the hygroscopic coefficient, that is, to 68 per cent of the wilting coefficient. Little difference was found between the ability of the various crop plants used in the experiment to exhaust the soil moisture; while, on the contrary, marked differences were evident in their ability to remain alive after showing injury from drought. Desert legumes of perennial habit remained alive after the water content of the soil had fallen distinctly below the hygroscopic coefficient, showing that the water taken by the soil from a saturated atmosphere may be to some extent available for the maintenance of the life of such plants, although it is evidently beyond the reach of ordinary crop plants. Incidentally, evidence is presented that in many soils of dry lands, the loss of water from all but the thin upper stratum takes places entirely through transpiration.

The bulletin reports a good example of an investigation in a quantitative manner of problems in plant production important alike to agriculture and ecology.—GEO. D. FULLER.

[29] ALWAY, F. J., Studies on the relation of the non-available water of the soil to the hygroscopic coefficient. Agric. Exp. Sta. Neb. Research Bull. 3:133. *figs.* 37. 1913.